Title: The Standard Model

Lecturer: Hitoshi Murayama

Date and Times:

- 20 July at 9:15
- 21 July at 9:15
- 22 July at 9:15
- 23 July at 9:15
- 24 July at 9:15

Summary of the proposed talk:

Prerequisite knowledge and references:

Biography-

Brief CV:

Appointed as the Director of a new $12M/year research institution Institute for the Physics and Mathematics of the Universe (IPMU) at University of Tokyo. It is one of the five centers instituted by the World Premier International Research Center Initiative

http://hitoshi.berkeley.edu/cv.pdf

Publications:

Popular Articles

Quantum Universe reports
Exposition of coming revolution in particle physics from HEPAP. I was on the production team.

Popular Talk

Mystery of Anti-matter (Video)
Talk at Physics is for Kids BBQ at Aspen Center for Physics aired by Grass Roots TV. See The Incredibles, Simpsons, and Einstein all in the same talk.
Flavor Physics -From icecream to the Universe-
Public lecture at Melbourne University, June 6, 2008
We like ice cream in many different flavors, but physicists are puzzled why there are so many flavors of elementary particles. Not only there are so many, one flavor might turn

into another before you get to eat it! Surprisingly, this may hold the key to why we exist in the universe at all.

- $E=mc^2$

2005 Buhl Lecture at Carnegie Mellon University, April 21, 2005

This famous equation, part of the theory of relativity set forth by Einstein in April 1905, changed our understanding of nature at the most fundamental level. "c" is the speed of light. It is the ultimate speed in the universe; nothing can go faster. "m" stands for mass. For centuries after Newton it was believed that mass is absolute. But this equation of Einstein revealed that mass is yet another form of energy, "E", that can change to other forms -- kinetic, gravitational, chemical, thermal, nuclear -- and back again to mass. An electron and an anti-electron annihilate into pure energy; in turn, energy can create matter and anti-matter. The fascinating story of energy and mass is still evolving a century since Einstein as we understand more of where they come from, how they shape the universe, and the missing pieces of the universe: Dark Matter and Dark Energy.

Watch a similar talk as one of the Lawrence Berkeley National Laboratory Summer Lectures aired on UCTV (Video)

Recent Talks for Physicists

- Quantum Universe (PDF, zipped Keynote, Video)

What is the Universe made of? How did it come to be? Why do we exist? This kind of fundamental questions about the Universe used to be just philosophy, but are now coming into the realm of quantitative science. The key is in quantum physics of elementary particles that determined the evolution of the Universe when it was very young. I will discuss this amazing connection between the large (the Universe) and the tiny (elementary particles), in the context of current and forthcoming experiments.

Department colloquium at University of Tennessee, Jan 22, 2007

- Outlook: The Next Twenty Years (PDF) and Keynote file in StuffIt archive

I discussed the convergence of many approaches and scientific questions in particle physics at the TeV energy scale. I listed four categories of big questions, "Horizontal," "Vertical," "Heaven," and "Hell." I discussed how these questions may be addressed at near-future experiments and theoretical developments.

(Concluding talk at Lepton Photon 2003 at Fermilab, Aug 11-16, 2003)

- The Next Twenty Years in Particle Physics (PDF version, 18.9MB) or (Keynote zipped, 20.0MB)

The particle physics is at a very exciting stage. Dark Matter, Dark Energy, Neutrino Mass, and Weak Force all suggest that TeV is the relevant energy scale of the problem. We are just about to probe this energy scale. The past two years the particle physics community went through the planning process for the next twenty years. The outcome was the realization that there are many deep scientific questions that can be addressed in the near future.

(Michigan State University Physics Department Colloquium, Mar 25, 2004)

- The Big World of Little Neutrinos (PowerPoint)

This is the historic era in neutrino physics. I first review the properties of neutrinos and discuss why neutrino masses are interesting probes to physics beyond the Standard Model. Then I discuss how we have recently learned that they do have tiny mass and will learn in the near future to settle the remaining issues. Finally I argue that neutrino masses may well be relevant to the question "why we exist" in our universe.

(UC Riverside Physics Colloquium, May 1, 2008)